

REMARKS

I. Introduction

In response to the Office Action dated February 8, 2007, claims 1, 4 and 7 have been amended. Claims 1-9 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Statutory Subject Matter Rejections

In paragraphs (2)-(3) of the Office Action, claims 1-9 were rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter.

Applicants' attorney has amended the claims to overcome these rejections.

However, should issues still remain in this regard, Applicants' attorney requests that the Examiner indicate how the rejection can be overcome, in accordance with the directives of the Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility (Guidelines) II. See also M.P.E.P. §2106. Specifically, should it be necessary, the Applicants' attorney requests that the Examiner identify features of the invention that would render the claimed subject matter statutory if recited in the claim. See Guidelines IV.B. See also M.P.E.P. §2106.

III. Prior Art Rejections

A. The Office Action Rejections

In paragraphs (4)-(5) of the Office Action, claims 1-9 were rejected under 35 U.S.C. §103(a) as being obvious in view of the combination of U.S. Patent 5,963,936 (Cochrane) in view of U.S. Patent No. 7,010,524 (Galindo-Legaria).

Applicants' attorney respectfully traverses these rejections.

B. The Applicants' Independent Claims

Independent claims 1, 4 and 7 are directed to a method, system and article of manufacture for optimizing a query. Claim 1 is representative and recites a method of optimizing a query in a computer system, the query being performed by the computer system to retrieve data from a database stored on the computer system, the method comprising: (a) during compilation of the query, maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form until after query rewrite; (b) at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP or CUBE operations

into a plurality of levels having one or more grouping sets comprised of grouping columns, and generating a query execution plan for the query with a super group block having an array of pointers, wherein each pointer points to a linked list representing grouping sets for a particular level; and (c) performing the query execution plan to retrieve data from a database stored on the computer system.

C. The Cochrane Reference

Cochrane describes a method and apparatus for detecting and stacking grouping sets to support GROUP BY operations with GROUPING SETS, ROLLUP and CUBE extensions in relational database management systems, with greatly reduced numbers of grouping sets. A first GROUP BY (element-list1) is input to a second GROUP BY (element-list2), resulting in the GROUP BY of the intersection of the two lists. This intersection property is then useable to reduce the number of GROUP BYs required to implement the grouping by GROUPING SETS, ROLLUPS, and CUBEs required for the online analytical processing of data contained in the database.

D. The Galindo-Legaria Reference

Galindo-Legaria describes validation of large numbers of alternative execution plans for a database query, either an exhaustive enumeration of the complete space of alternatives, or else an unbiased random sample, that is performed by efficiently constructing execution trees from a data structure having groups alternative operators that are ranked in a directory. Each global rank of a plan identifies that plan uniquely among all the alternative plans. The operators are unranked from the directory according to a specification that characterizes the desired plans.

E. Applicants' Claims Are Patentable Over The References

Applicants' invention, as recited in independent claims 1, 4 and 7, is patentable over the combination of Cochrane and Galindo-Legaria, because the claims recite limitations not found in the references.

Nonetheless, according to the Office Action, Cochrane teaches the "maintaining" element of Applicants' independent claims at col. 7, lines 26-30 and 44-48, and Cochrane teaches the "translating" element of Applicants' independent claims at col. 8, lines 26-42 and Figure 7. However, the Office Action admits that Cochrane does not teach generating a query execution plan

with a super group block having an array of grouping sets, wherein each pointer points to a linked list representing grouping sets for a particular level. Nonetheless, the Office Action asserts that Galindo-Legaria teaches these limitations at col. 5, lines 25-34, col. 5, lines 56-63 and Figure 3.

Moreover, in response to Applicants' arguments, the Office Action states the following:

Response to Arguments

6. Applicant's arguments filed 16 November 2006 have been fully considered but they are not persuasive.

Applicant argues that the combination of Cochrane et al. and Galindo-Legaria et al. does not "maintain the GROUP BYs in their original form until after query rewrite".

This argument is not correct. Cochrane et al., in column 8, lines 26-30, teaches "generally, the query parser lexes, parses, and semantically checks a query, producing an internal representation (a "query graph model") that is rewritten and submitted to the optimizer which generates an optimized query execution plan". The internal representation is "maintained" until it is rewritten. Once the query is rewritten, it is "after query rewrite". As the internal representation is rewritten, it is no longer "maintained".

Applicant argues that the structure in Galindo-Legaria et al. has nothing to do with "grouping sets comprised of grouping columns". In response to this argument, Examiner notes that Cochrane et al. teaches "grouping sets comprised of grouping columns".

Applicants' attorney disagrees with this analysis. The combination of Cochrane and Galindo-Legaria does not teach or suggest all the limitations recited in independent claims 1, 4 and 7.

With regard to the limitations "during compilation of the query, maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form until after query rewrite," which the Office Action asserts is described by Cochrane at col. 7, lines 26-30 and 44-48, these portions of Cochrane are set forth below:

Cochrane: Col. 7, Lines 26-30

Generally, the query parser 92 lexes, parses, and semantically checks a query, producing an internal representation (a "query graph model") that is rewritten and submitted to the optimizer which generates an optimized query execution plan.

Cochrane: Col. 7, Lines 44-48

The system of FIG. 5 employs the invention to produce a QGM in which the number of GROUP BYs necessary to execute a GROUP BY with multiple GROUPING SETS, concatenated ROLLUPS, or a CUBE has been reduced.

The description from Cochrane set forth above merely describes the translation of a query into a "query graph model" that is rewritten and submitted to an optimizer which generates an

optimized query execution plan, wherein the optimization of GROUP BYs is performed by stacking, which reduces the number of GROUP BYs while producing identical results. However, this optimization scheme of Cochrane says nothing about maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form until after query rewrite. Instead, the optimization scheme of Cochrane reduces the GROUP BYs during query rewrite, which necessarily comprises not maintaining the GROUP BY clause until after query rewrite.

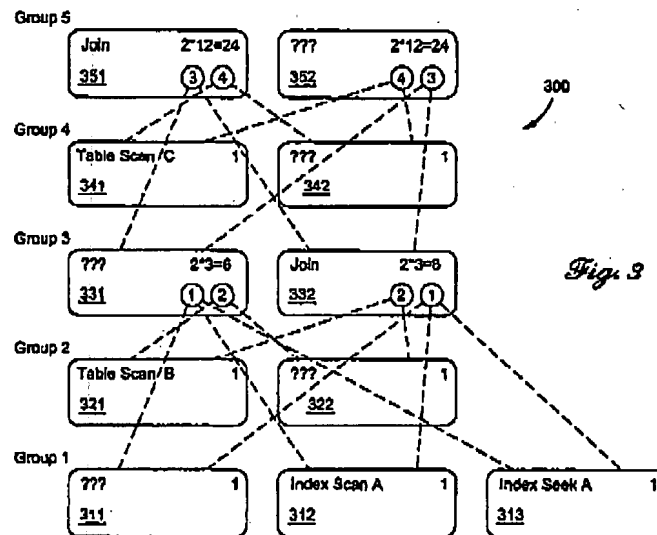
In addition, as noted above, the Office Action admits that Cochrane does not reach the limitations "generating a query execution plan with a super group block having an array of pointers, wherein each pointer points to a linked list representing grouping sets for a particular level," but the Office Action does assert that these limitations are described by Galindo-Legaria at col. 5, lines 25-34, col. 5, lines 56-63 and Figure 3, and these portions of Galindo-Legaria are set forth below:

Galindo-Legaria: Col. 5, Lines 25-34

The optimizer stores the alternative plans in data structure 250. This data structure, a table in this embodiment, stores alternative operations and their interconnections at a number of different levels, as described hereinafter. This table is not destroyed in the process of determining an optimum plan, but is kept for later construction of alternative plans other than the single optimum plan. Ranking module 260 builds a directory 251 having pointers to the locations of various operators and groups within structure 250, and computes "rank data."

Galindo-Legaria: Col. 5, Lines 56-63

FIG. 3 is a symbolic diagram 300 of a portion of an illustrative table 250 for compactly encoding information required to construct multiple execution plans so as to take advantage of the many common parts among different alternative plans. A number of groups, five in this example, each contain a collection of operators that point to other groups as children. Each candidate plan is a tree of these operators extracted from the groups.

Galindo-Legaria: FIG. 3

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The description from Galindo-Legaria set forth above describes a structure to store alternative query execution plans, but the only “groups” described are groups of operators that are shared among alternative query execution plans. However, this structure in Galindo-Legaria has nothing to do with “grouping sets comprised of grouping columns” as recited in Applicants’ claims. Instead, the structure of Galindo-Legaria has a completely different purpose, namely grouping common operators shared among different alternative plans.

Nonetheless, the Office Action suggests replacing the groups of operators in Galindo-Legaria with the grouping sets comprised of grouping columns in Cochrane. However, such a modification would change the operation of Galindo-Legaria; indeed, it would render Galindo-Legaria inoperative, because the structure of Galindo-Legaria would comprise grouping sets (which are not operators) rather than operators. Moreover, the modification is suggested by the Office Action itself, rather than the references, which constitutes impermissible hindsight.

Thus, Applicants' attorney submits that independent claims 1, 4 and 7 are allowable over the combination of Cochrane and Galindo-Legaria. Further, dependent claims 2, 3, 5, 6, 8 and 9 are submitted to be allowable over the combination of Cochrane and Galindo-Legaria in the same manner, because they are dependent on independent claims 1, 4, and 7, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2, 3, 5, 6, 8 and 9 recite additional novel elements not shown by the combination of Cochrane and Galindo-Legaria.

IV. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.


Respectfully submitted,

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